JustMaths

Countdown to your final Maths exam ... part 2

Examiners Report & Markscheme

Examiner's Report

Q1.
A variety of diagrams were seen. Some candidates insist on joining the first to last points forming an enclosed shape. This may come from their interpretation of the word polygon in this question. Centres should ensure candidates are aware this is not correct when drawing a frequency polygon. Another common error is to plot the heights at the end of the intervals. If candidates did this consistently they were awarded one mark. Some candidates draw the histogram first and then add the frequency polygon, this is an acceptable method and full marks can be awarded.

Q2.
In part (a), there were a number of ways to gain the first mark in this part and many were able to gain at least one mark. Most were for at least one correct value in the table. Although a few managed to demonstrate that frequency = frequency density x column width, or a correct frequency density scale was seen. It was rare to see a correct area identified. The most commonly seen errors were 90 for the first frequency.

Part (b) was answered consistently well but common errors were drawing the first bar at 3cm and the second bar at either 4.8cm or 1.2cm for those that did not find the correct scale, or forgot to change the class width accordingly.

Part (c) proved to be beyond the capabilities of all but the very able. Although many candidates were able to find the interval in which the median lay, very few were able to progress beyond this point and either left their answer as a range or else gave the middle value of the group. A number of candidates attempted to calculate an estimate for the mean.

Q3.
The majority realized that the diagonal was to be found using Pythagoras. Weaker candidates doubled rather than squaring in calculating Pythagoras. Those who failed to choose Pythagoras as a method either guessed the length of the diagonal, or estimated its length from the two given sides. If made clear, they could then gain some credit from calculating the total of their six lengths.

Q4.
This question was well attempted and blank responses were rare. Despite the circle most candidates realised that Pythagoras was needed to find the diameter and then went on to find the circumference though a few stopped after finding the diameter forgetting that the question required them to find the circumference. Students were confusing circle formulae and some were finding the area or misremembering the formula completely. The small number of students lost one mark due to premature rounding of their value for the diameter. Only the very weakest students were failing to score any marks usually due to not using Pythagoras at all.

Q5.
Most candidates scored either 1 mark (for *AB* = 5 cm), or full marks for finding the length of *AD* correctly. It was very common to see the sine rule being used in the right angled triangle *ABD*, sometimes involving the right angle and sometimes the 54°. A few candidates used tan and Pythagoras in triangle *ABD*. Providing all the steps involved were logically correct, they were awarded the two method marks. Often this approach led to an answer outside the acceptable range, due to accumulation of rounding errors.

Q6.
The correct answer was often seen but not always the result of the most straightforward method. Many candidates found the length *DF* by Pythagoras and then used sine or cosine. Some even attempted to use the sine rule. However, many choosing these alternative approaches made careless mistakes in their algebraic manipulation and failed to score as a result.

A significant number started well with "tan = $\frac{86}{37}$" but could go no further.

Q7.
Again there were quite a number of nil attempts. However, most students identified that they needed to use Pythagoras as a first step, and AC was usually found correctly. It was rare to find students

proceeding further in a logical way, since many incorrectly assumed that CBD or ABD was 45°. Any attempt at using trigonometry was usually based on an incorrect side or angle. No student used a similar triangle approach.

Q8.
Many candidates were not sure how to approach this question. Perhaps many were used to more guidance in class (e.g. draw up a table of values). Where students provided a table of values, most showed they understood the equation and completed the table well. However some candidates failed to deal with the substitution of the negative values of x into the equation as demonstrated by the calculations around the question. Many took values outside the given range of $x = -3$ to $x = 1$. This was not necessary and created some difficulties with the larger negative numbers. It was good to see that over 44% of the candidates provided the correct straight line for values of x between –3 and 1. However, a few candidates plotted the correct points and then failed to join them up. There were some candidates who used the m and c values to draw the graph without plotting any individual points but many of these confused the gradient and intercept values and drew the graph of $y = 3x + 2$ rather than the required $y = 2x + 3$.

Candidates appeared well equipped and the majority of lines were ruled rather than hand drawn.

Q9.
Perhaps surprisingly, it is disappointing to report that many students were unable to identify what they needed to do in this question, particularly in part (b). Those students who did realise that they needed to divide cost by number of cubic metres of water often took the readings from one point and divided the y coordinate by the x coordinate rather than the increase in cost divided by the increase in volume, that is they failed to find the gradient of the line. Methods were often not made clear and relatively few students showed a triangle drawn on the line to help them work out the gradient. Where students did draw triangles and use an appropriate method for finding the gradient, they often did not interpret the scales on the axes correctly and so obtained an incorrect answer. Thus relatively few students were awarded 1 mark for a correct method (but an incorrect answer). Some students answered part (b) in the working space for part (a).

Q10.
Many students made a good attempt to draw the graph and most of the work seen was accurate. The most common error was to calculate and use the value of the function at $x = 3$ to be 0.3. An answer using 0.3 was not appropriate as the grid allowed more accuracy than one decimal place in the plotting of values. Graphs including the point (3, 0.3) could therefore not be awarded full marks.

Q11.
Many values were given correctly in part (a). The most common error was in giving and answer of 3 or -3 for x=-1. Plotting points was quite well done in part (b); nearly all candidates realised that a curve was needed to join the points.

Q12.
The majority of candidates gained full marks for this question, finding the missing values and drawing a correct graph. Very few candidates failed to calculate at least one correct value. The points were usually accurately plotted although the point (2, 11) was sometimes plotted at (2, 13). Some candidates only gained one mark in part (b) as they joined the points with straight lines rather than drawing the curve freehand. Some did not join the points at all and some drew a line of best fit for the points. Curves were sometimes inaccurate, not passing through the points exactly or drawn with too thick a line or with several lines. Some candidates seemed to have pre-conceived ideas as to what the graph should look like and drew a parabola that contradicted their calculations.

Mark Scheme

Q1.

		Working	Answer	Mark	Notes
			Points plotted at (5, 6), (15, 9), (25, 8), (35, 7), (45,5) and joined with line segments	2	B2 for correct plotting of 5 points and joining with line segments (B1 for points plotted correctly at midpoints of intervals **OR** joining points with line segments at the correct heights and consistent within the class interval (including end values) **OR** correct frequency polygon with one point incorrect **OR** correct frequency polygon with first and last points joined) NB Ignore any histogram drawn and any part of frequency polygon outside range of first and last points plotted

Q2.

Question	Working	Answer	Mark	Notes
(a)		(20), (30), 45, 60, (48)	2	M1 for frequency = fd × column width, can be implied by 1 frequency correct OR fd correctly marked on vertical axis 2cm=1unit OR identifying 1 cm^2 as frequency of 5oe A1 45 and 60 both correct
(b)		histogram bars	2	B2 for 2 correct histogram bars; heights at 6cm and 2.4cm (B1 1 correct bar)
(c)	Area method: Total area 40.6 cm^2 For median: ÷2 = 20.3 0 to 40 is 19 cm^2 median lies 41–43 OR Proportionality method: Total 203 ÷ 2 = 101.5; 0 to 40 is 95 40–60: 6.5÷60×20=2.16 Median is 40+2.16 = 42.16 OR 204÷2=102; 0 to 40 is 95 40-60: 7÷60×20=2.3… Median is 40+2.33=42.33	41 – 43	2	Area method: M1 ft for calculation of total area and division by 2 (eg 40.6÷2 or 20.3) A1ft answer 41–43 OR Proportionality method: M1 ft for 203÷2=101.5 and 6.5÷60×20=2.16 or 204÷2=102 and 7÷60×20=2.33… A1 ft answer 41–43

Q3.

Question		Working	Answer	Mark	Notes
		$\sqrt{39^2 + 52^2}$ = $\sqrt{4225}$ = 65 2×65 + 2×39 + 2×52 = 156×2 = $\sqrt{39^2 + 52^2}$ = $\sqrt{4225}$	312	5	M1 for $39^2 + 52^2$ or 1521 + 2704 or 4225 M1 for $\sqrt{39\times39+52\times52}$ or $\sqrt{1521 + 2704}$ or $\sqrt{4225}$ A1 for 65 seen or diagonal length of 65 (oe) indicated on diagram, or other Pythagorean length justified. M1 for 2 × "65" + 2 × 39 + 2 × 52 (= 156 × 2) or 130 + 182 A1 cao

Q4.

Question	Working	Answer	Mark	Notes
		29.6	4	M1 for $8^2 + 5^2$ or 64 + 25 or 89 M1 (dep) $\sqrt{"8^2"+"5^2"}$ (=9.4) M1 for "9.4..." × π A1 for 29.5 – 29.65

Q5.

Question		Working	Answer	Mark	Notes
		$AB = 5 \sin 36 = {}^{5}/_{AD}$ $AD = {}^{5}/_{\sin 36}$ Or $\sin 36 = {}^{5}/_{BC}$ $BC = {}^{5}/_{\sin 36}$ $AD = BC$ OR $\cos 54 = {}^{5}/_{BC}$ $BC = {}^{5}/_{\cos 54}$	8.51	4	B1 $AB = 5$ M1 $\sin 36 = {}^{5}/_{AD}$ or $^{\sin 36}/_{5} = {}^{\sin 90}/_{AD}$ M1 $AD = {}^{5}/_{\sin 36}$ or $AD = {}^{5 \sin 90}/_{\sin 36}$ A1 8.5 – 8.51 OR M1 $\sin 36 = {}^{5}/_{BC}$ or $^{\sin 36}/_{5} = {}^{\sin 90}/_{BC}$ M1 $BC = {}^{5}/_{\sin 36}$ or $BC = {}^{5 \sin 90}/_{\sin 36}$ B1 $AD = 'BC'$ A1 8.5 – 8.51 OR B1 angle $DCB = 54$ or angle $DBC = 36$ M1 $\cos 54 = {}^{5}/_{BC}$ M1 $BC = {}^{5}/_{\cos 54}$ A1 8.5 – 8.51 NB other methods such as tan + Pythagoras must be complete methods and will earn M2

Q6.

PAPER: 5MB3H_01				
Question	**Working**	**Answer**	**Mark**	**Notes**
		66.7	3	M1 for $\tan(y =) \frac{86}{37}$ (= 2.3243..) M1 (dep) for $\tan^{-1}$ "2.32(43..)" = or $\tan^{-1}\left(\frac{86}{37}\right)$ (accept 'shift tan' or 'inv tan' for $\tan^{-1}$) A1 for answer in the range 66.6° to 66.8° [SC: B1 for an answer in the range 23.2 to 23.3 if M0 scored]

Q7.

PAPER: 1MA0_2H					
Question		**Working**	**Answer**	**Mark**	**Notes**
		$AC^2 = 5^2 + 3^2$ $AC = \sqrt{25+9}$ (=5.83) $\frac{5}{5.83} = \frac{DB}{3}$ $DB = \frac{5}{5.83} \times 3$ (= 2.57) $5 + 3 + 5.83 + 2.57 =$ **OR** $AC = \sqrt{25+9}$ (=5.83) $\tan A = \frac{3}{5}$ $A = 30.96$ $\sin 30.96 = \frac{DB}{5}$ $DB = 5 \times \sin 30.96$ (= 2.57) $5 + 3 + 5.83 + 2.57 =$	16.4	5	M1 for $(AC^2) = 5^2 + 3^2$ =34) M1 for $\sqrt{25+9}$ or $\sqrt{34}$ (=5.83) M1 for $\frac{5}{'5.83'} = \frac{DB}{3}$ or $DB \times AC = 5 \times 3$ M1 for $(DB =) \frac{5}{'5.83'} \times 3$ A1 for 16.4 to 16.41 **OR** M1 for $(AC^2) = 5^2 + 3^2$ (=34) M1 for $\sqrt{25+9}$ or $\sqrt{34}$ (=5.83) M1 for using a correct trig ratio in an attempt to find angle A or angle C, e.g. $\tan A = \frac{3}{5}$, $\sin A = \frac{3}{'5.83'}$, $\cos C = \frac{3}{'5.83'}$ M1 for using DB in a correct trig ratio, e.g. $\sin '30.96' = \frac{DB}{5}$ A1 for 16.4 to 16.41

Q8.

<table>
<tr><th>Question</th><th>Working</th><th>Answer</th><th>Mark</th><th>Notes</th></tr>
<tr>
<td></td>
<td>$y = 2x + 3$
<table><tr><td>x</td><td>–3</td><td>–2</td><td>–1</td><td>0</td><td>1</td></tr><tr><td>y</td><td>–3</td><td>–1</td><td>1</td><td>3</td><td>5</td></tr></table></td>
<td>Line</td>
<td>3</td>
<td>(Table of values)

M1 for at least 2 correct attempts to find points by substituting values of x

M1 ft for plotting at least 2 of their points
(any points plotted from their table must be correct)

A1 for correct line between –3 and 1
(No table of values)

M2 for at least 2 correct points
(and no incorrect points) plotted

OR line segment of $2x + 3$ drawn
(ignore any additional incorrect segments)

(M1 for at least 3 correct points with no more than 2 incorrect points)

A1 for correct line between –3 and 1
(Use of $y = mx + c$)

M2 for at least 2 correct points
(and no incorrect points) plotted

OR line segment of $2x + 3$ drawn
(ignore any additional incorrect segments)

(M1 for line drawn with gradient of 2

OR line drawn with a y intercept of 3 and a positive gradient

A1 for correct line between –3 and 1</td>
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Q9.

Paper_ 5MB1H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
	(a)		14	1	B1 cao
	(b)		1.20	2	M1 for attempt to find the gradient oe of the line eg drawing a right angled triangle with base & height shown, or $\frac{y_2 - y_1}{x_2 - x_1}$, values shown A1 for 1.20 (accept 1.2)

Q10.

PAPER: 5MB3H_01					
Question		**Working**	**Answer**	**Mark**	**Notes**
			curve	3	M1 for calculating at least 3 values of $y = \frac{1}{x}$ in the interval M1 for plotting at least 4 correct points (condone one error) A1 cao

Q11.

Question		**Working**	**Answer**	**Mark**	**Notes**
	(a)	(–2,7), (–1,1), (0,–1), (1,1), (2,7)	1, –1, 7	2	B2 all 3 correct (B1 for 1 or 2 correct) OR M1 for attempt to plot x^2 M1 for attempt to draw x^2
	(b)		Curve drawn	2	M1 at least 4 points plotted from their table; all points ±1 small square A1 cao for correct curve drawn OR M1 for curve $2x^2$ seen, or parabolic curve drawn through (0,–1)

Q12.

		Working	**Answer**	**Mark**	**Notes**
	(a)		–13, –1, 2	2	B2 for all values correct (B1 for any one value correct)
	(b)		Graph drawn	2	M1 ft for at least 4 points plotted correctly from their table A1 cao for correct curve drawn from (–2, –13) to (2, 11)